



# **OPERATIONNAL ASPECTS OVERALL SPOT OPERATIONAL CONFIGURATION**

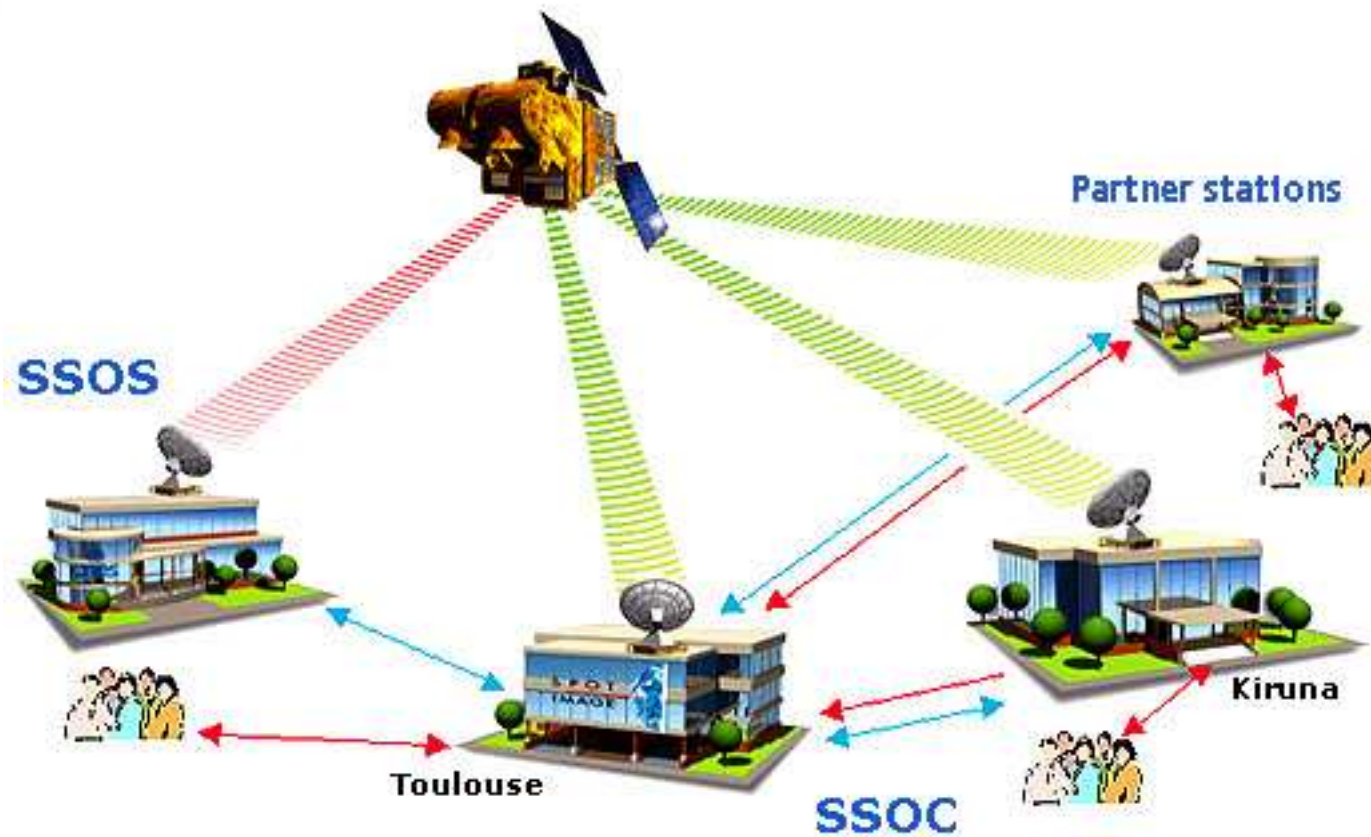
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# outlines

- ⇒ The whole system : description of the ground segment
- ⇒ Commercial operations ground segment
  - Programming center
  - Receiving Antenna
  - Archive and pre-processing center
- ⇒ Operation control center
  - Station monitoring
  - Station performances
- ⇒ Conclusions

# Spot System



# Spot System

- ⇒ Commercial operations ground segment (SSOC)
  - Spot Image is the commercial operator of the SPOT system
  - The interface between users and the space segment
  - a central hub in Toulouse, France
  - Receives data from stations in Toulouse and Kiruna, Sweden, and from a network of ten partner receiving stations.
- ⇒ Operation control center (CMP or SSOS)
  - a housekeeping management centre
    - ◆ controls housekeeping systems
    - ◆ determines satellite orbits
    - ◆ manages the attitude and orbit control subsystem
    - ◆ archives data used to keep a check on satellite health
  - a mission control centre
    - ◆ generates satellite programming messages in accordance with the workplan uplinked by the SSOC
    - ◆ where engineers can make checks on the image acquisition process whenever needed



## Commercial operations ground segment

### *Programming Center*

Image acquisition requests are centralized at the Programming Centre (CPR), which optimizes satellite programming in accordance with weather forecasts and the results of previous acquisition attempts.

- ⇒ plans long-term usage of satellite capacity, assessing the best chances of successfully acquiring scenes, taking into account programming request conflicts, commercial priorities and local weather conditions;
- ⇒ schedules daily image acquisitions in accordance with weather forecasts to fulfil as many customer requests as possible, as quickly as possible, taking into account direct programming requests from receiving stations in the SPOT network;
- ⇒ optimizes acquisition of stereopair images.

The 24-hours workplan for SPOT 5 is forwarded to the CMP Operations Control Centre for uplinking to the satellite in the morning.



# Commercial operations ground segment

## *Receiving Antennas*



ELS station in Toulouse  
(Easy Link to Spot)

### Main performance features of ELS:

- ⇒ fully automated entry of pointing and reception data and recording of raw image data,
- ⇒ acquires signals from 5° elevation upwards and is capable of tracking through the zenith,
- ⇒ RF frequency band: 8.0 to 8.4 GHz,
- ⇒ figure of merit: 25.5 dB/K at 10° elevation,
- ⇒ low demodulation degradation: 0.8 dB overall,
- ⇒ ellipticity: 1.0 dB maximum,
- ⇒ excellent availability thanks to proven equipment,
- ⇒ sophisticated digital processing,
- ⇒ the same processor handles control and monitoring functions,
- ⇒ tracking in coherent or non-coherent mode (accuracy = 0.1°), or in programmed ephemeris mode (accuracy = 0.2°) in wind conditions of 25 m/s.



## Commercial operations ground segment

### *Archive and preprocessing center*

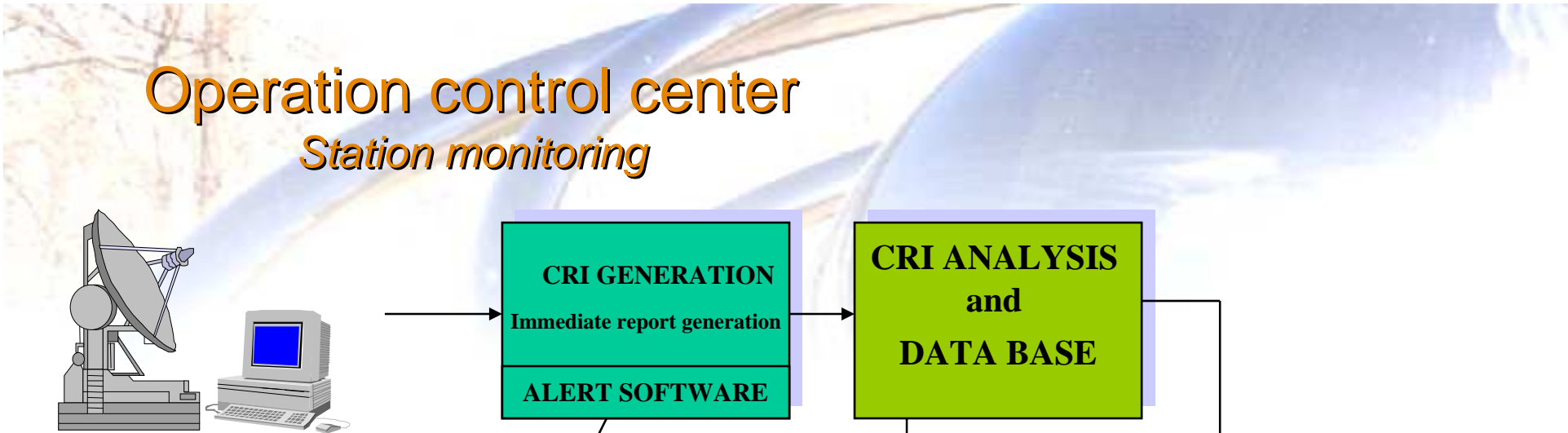
Converts image telemetry into standard SPOT products

- ⇒ applies radiometric and geometric corrections to raw image data.
  - For example, for high-resolution products (2.5 metres), image restoration is a very complex process involving some 2,000 operations on each of an image's 24,000 x 24,000 pixels
- ⇒ Preprocessed imagery can be delivered on CD-ROM, DAT, DVD or on line.
- ⇒ The CAP at Spot Image is capable of generating 150 to 200 products a day.

The diagram illustrates the workflow of the Operation control center Station monitoring system. It features a background image of a satellite dish and a computer monitor. The process flow is as follows:

- Input:** Data from the satellite dish and computer monitor is fed into the system.
- CRI GENERATION:** This stage includes "Immediate report generation" and "ALERT SOFTWARE".
- CRI ANALYSIS and DATA BASE:** The output from the CRI GENERATION stage is processed here.

```
graph LR; Input[Satellite Dish & Computer Monitor] --> CRI_GENERATION[CRI GENERATION  
Immediate report generation  
ALERT SOFTWARE]; CRI_GENERATION --> CRI_ANALYSIS[CRI ANALYSIS and DATA BASE];
```







# Operation control center

## *Station monitoring*

### **CRI ANALYSIS :**

- Acquisition of demod lock and unlock
- Compare real beginning (demod lock) and end of pass (demod unlock) with scheduled pass

### **3 status are available :**

- If the two periods are the same : PASS OK
- if the two periods are different (losses during pass) : PARTIAL PASS
- if no lock has been detected : LOST PASS

Additional analysis is performed on the magnetic recorders.



# Operation control center

## *Station performances*

The station 's performances are assess with statistical tools.

PASS OK and LOST PASS are first taken into account.

PARTIAL PASS requires a particular investigation to determine if it will go into OK or LOST category.

This investigation is based on the commercial impact of the missing telemetry.

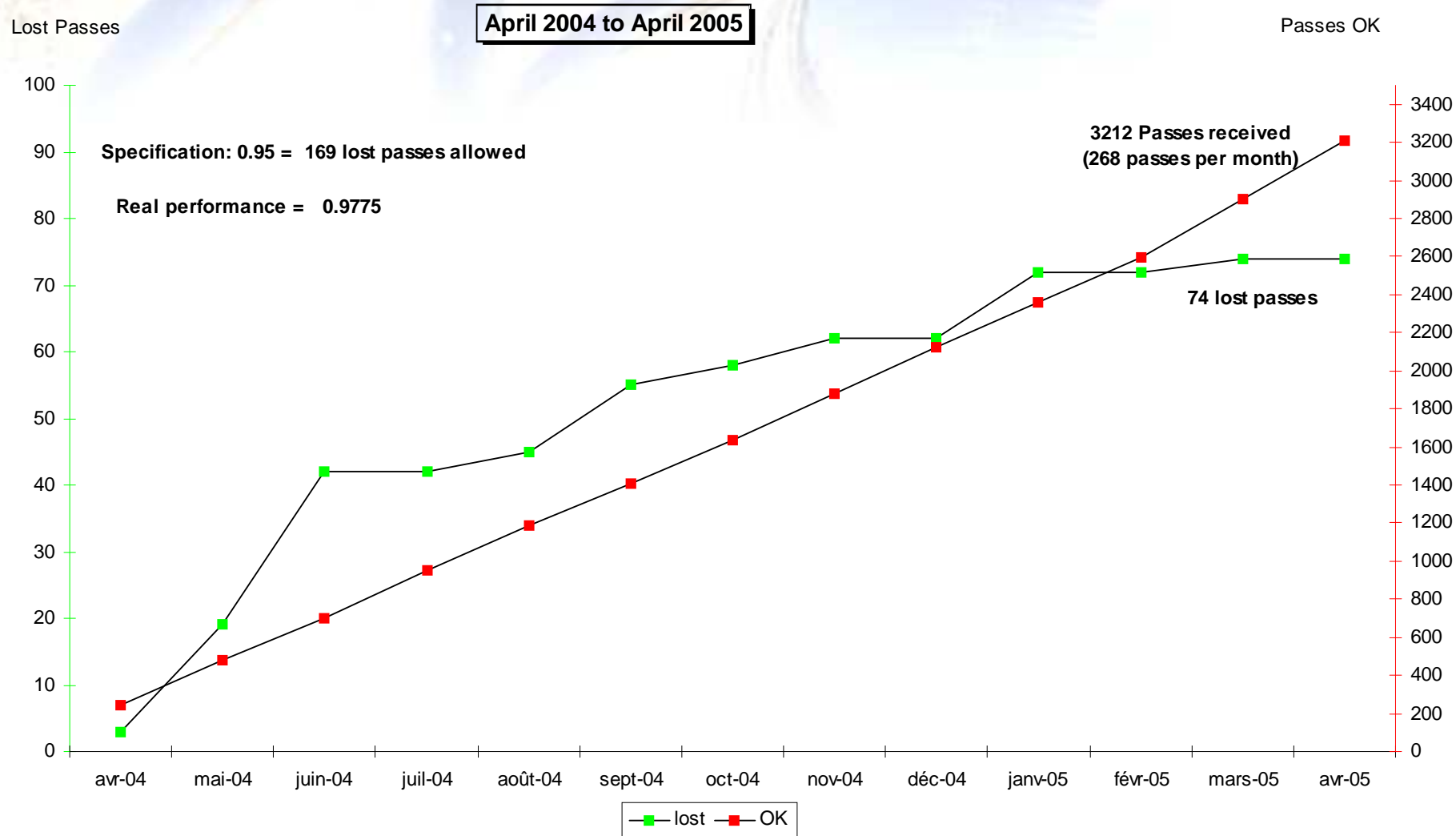
The average amount of rough partial passes is 0.5% of the total amount of the programmed passes.

Main causes of partial pass :

- demodulator troubleshooting
- late acquisition (imprecised orbit data)
- imprecised pointing (wrong time processing)

# Operation control center

## Station performances



A blue bird, possibly a kingfisher, is shown in flight against a background of bare, brown trees. The bird is positioned in the upper right quadrant of the slide, with its wings spread. The word "Conclusion" is overlaid on the image in a bold, orange font.

# Conclusion